June 24, 1930. A. E. SCHUTTE 1,765,778

METHOD OF SATURATING FIBROUS MATERIAL

Filed Sept. 18, 1925 6 Sheets-Sheet 1

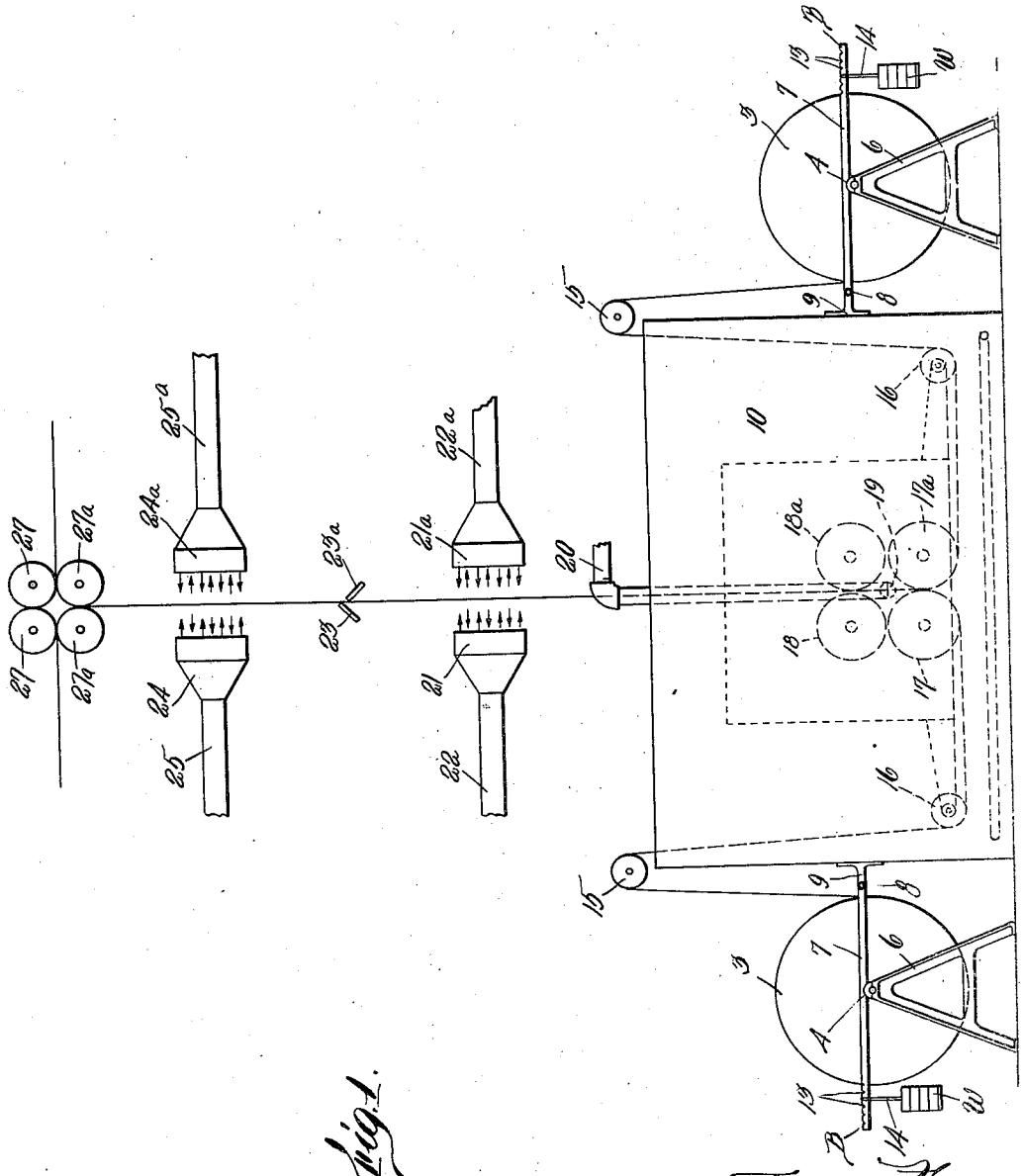


Fig. 1.

Inventor:
August E. L. Schutte
by Wright Brown Quinby & May
Attys.

June 24, 1930. A. E. SCHUTTE 1,765,778

METHOD OF SATURATING FIBROUS MATERIAL

Filed Sept. 18, 1925 6 Sheets-Sheet 2

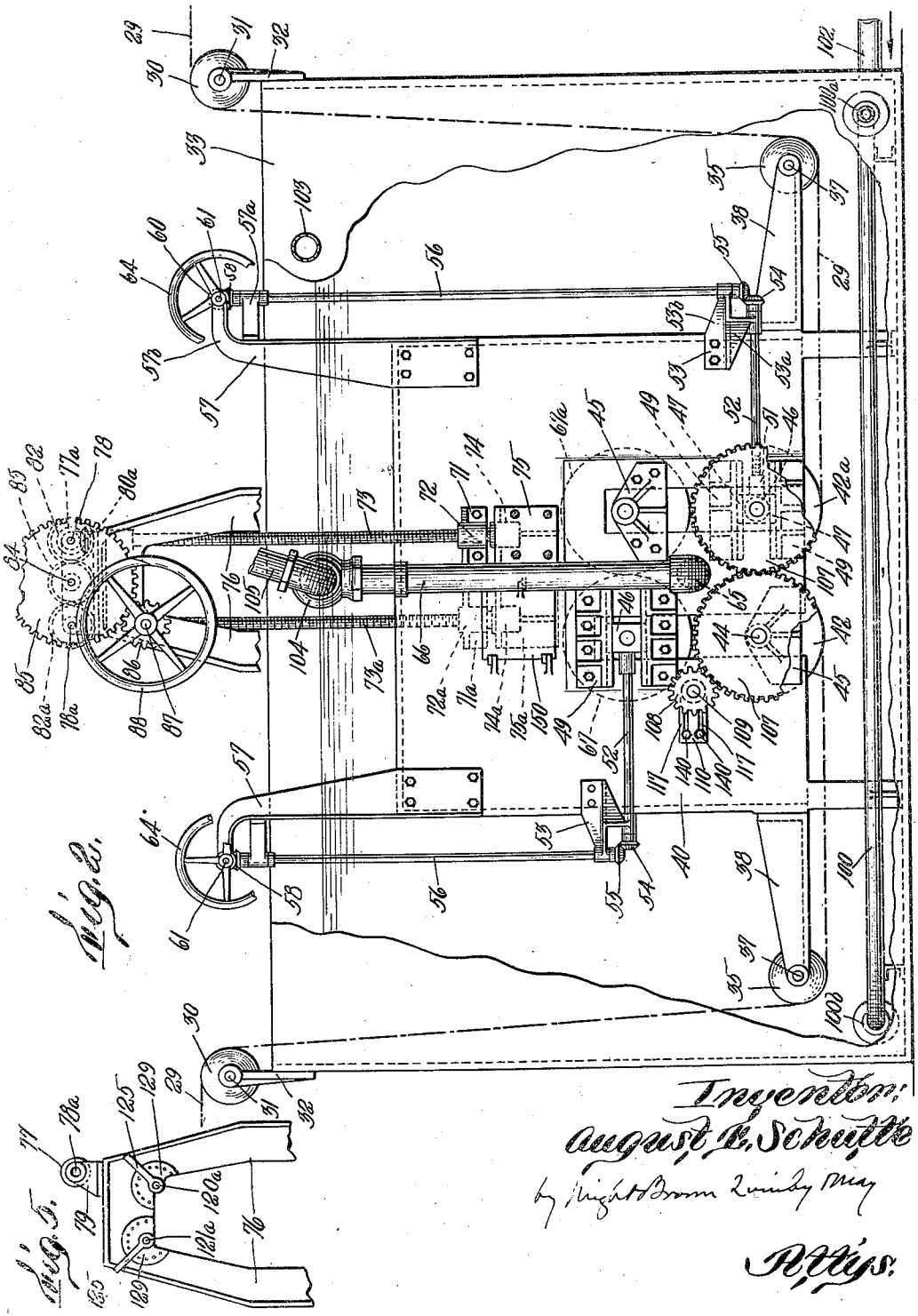


Fig. 2.

Fig. 5.

Inventor:
August E. Schutte
by Wright Brown Quinby & May
Attys.

June 24, 1930. A. E. SCHUTTE 1,765,778

METHOD OF SATURATING FIBROUS MATERIAL

Filed Sept. 18, 1925 6 Sheets-Sheet 3

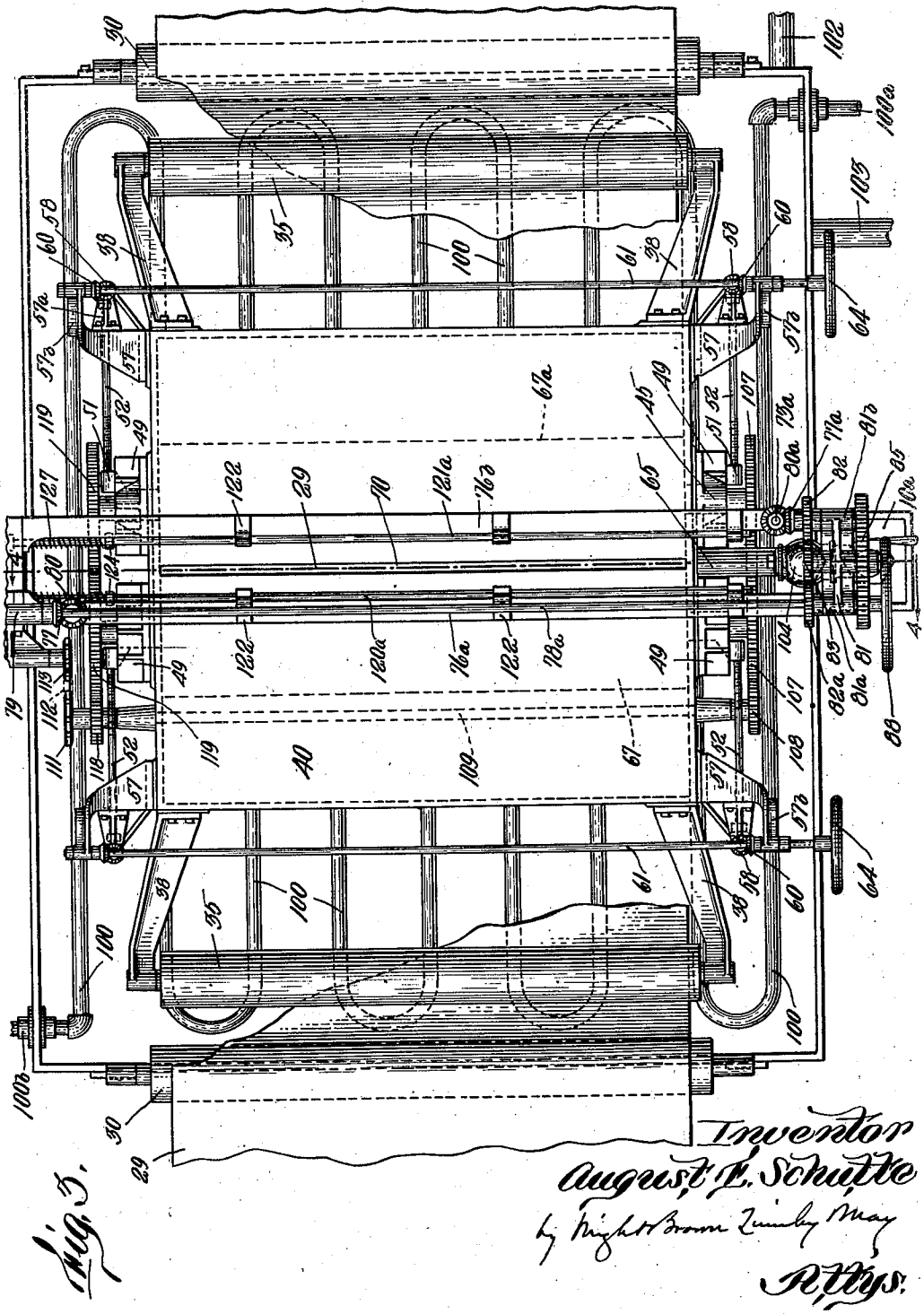


Fig. 3.

Inventor
August E. Schutte
by Wright Brown Quinby & May
Attys.

June 24, 1930. A. E. SCHUTTE 1,765,778

METHOD OF SATURATING FIBROUS MATERIAL

Filed Sept. 18, 1925 6 Sheets-Sheet 4

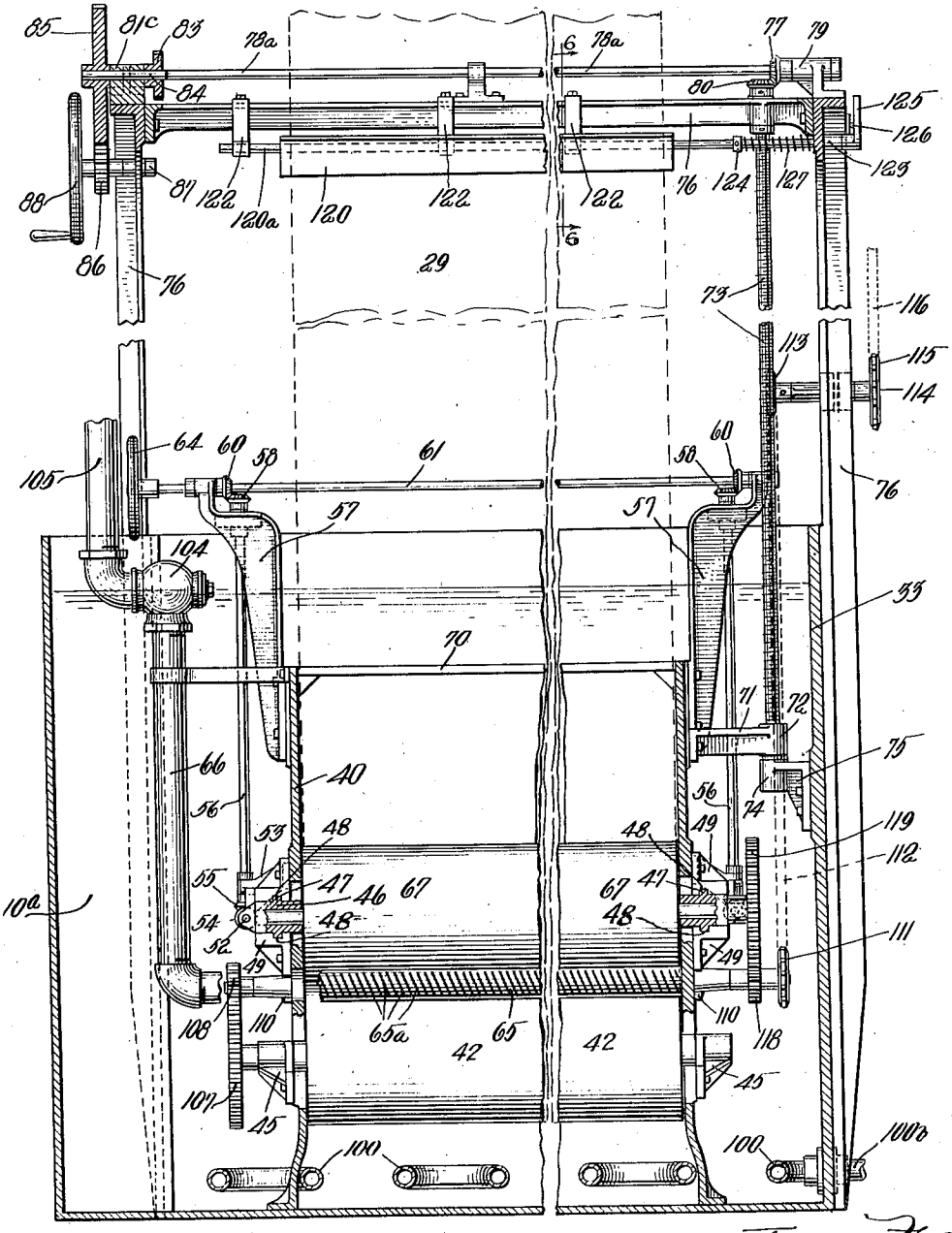


Fig. 4.

Inventor
August E. Schutte
by Wright Brown Quinby & May
Attys.

June 24, 1930. A. E. SCHUTTE 1,765,778

METHOD OF SATURATING FIBROUS MATERIAL

Filed Sept. 18, 1925 6 Sheets-Sheet 5

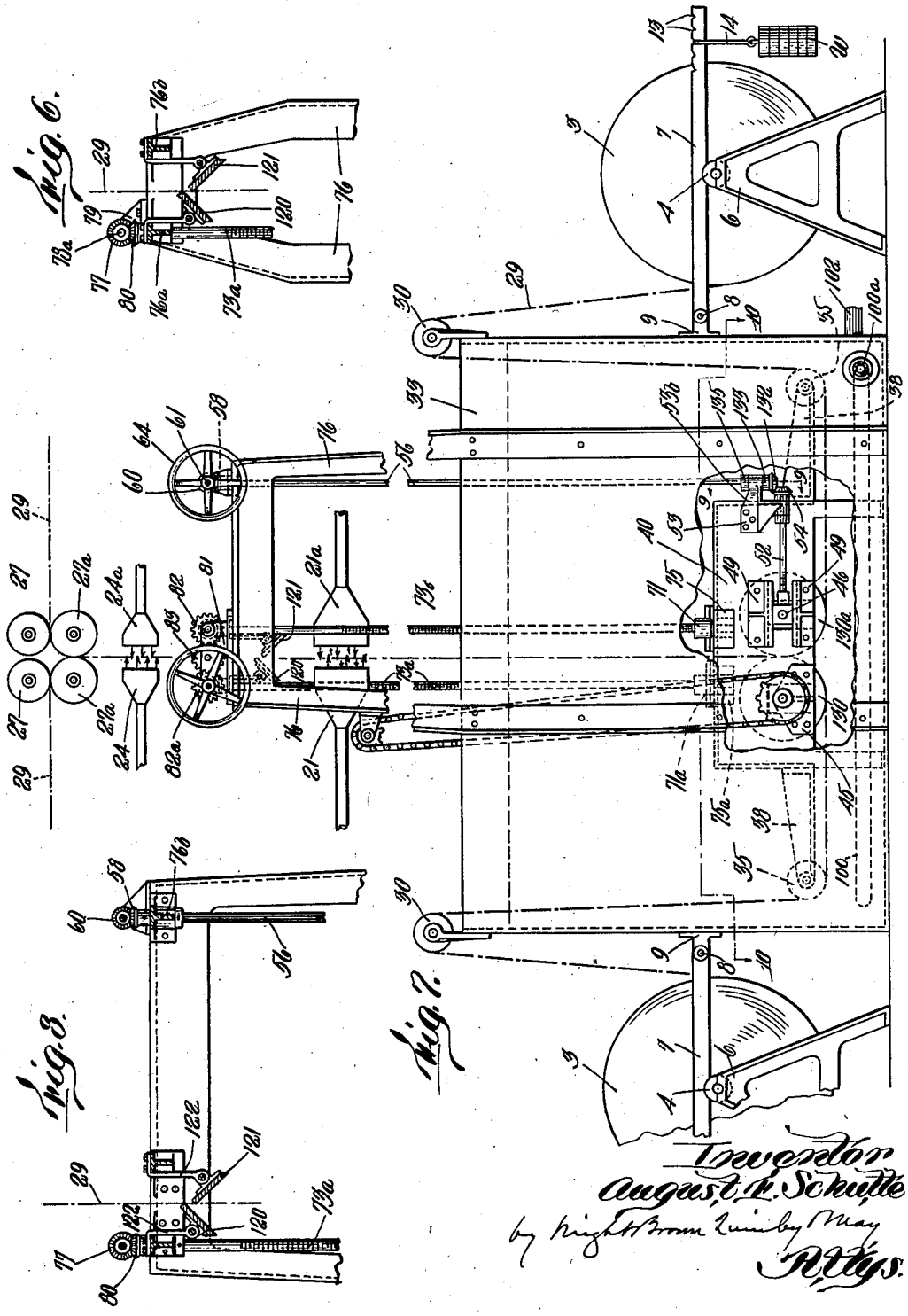


Fig. 6.

Fig. 8.

Fig. 7.

Inventor
August E. Schutte
by Wright Brown Quinby & May
Attys.

June 24, 1930. A. E. SCHUTTE 1,765,778

METHOD OF SATURATING FIBROUS MATERIAL

Filed Sept. 18, 1925 6 Sheets-Sheet 6

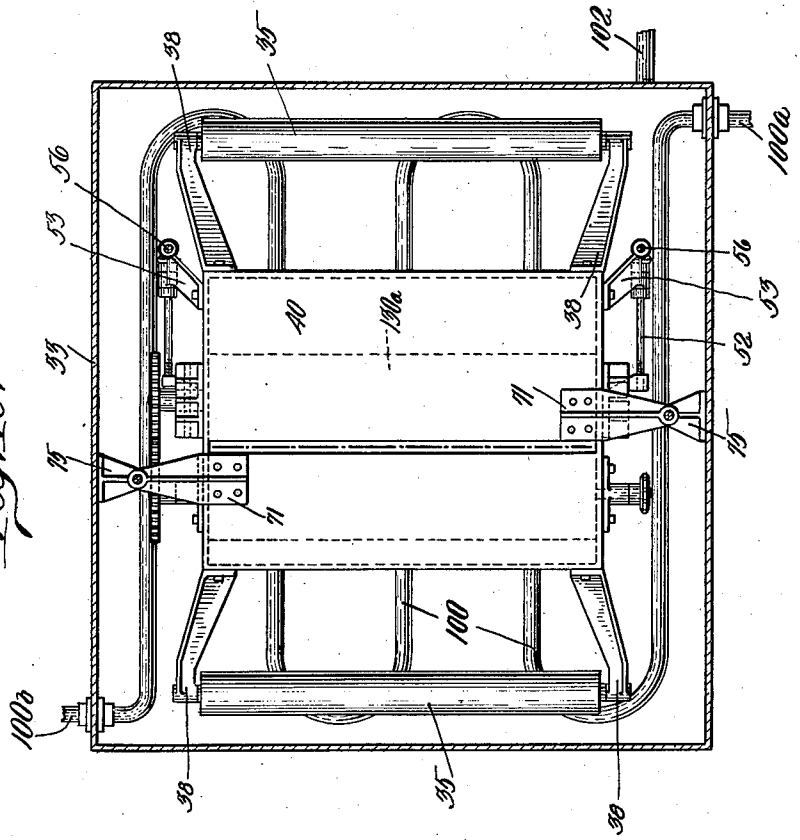


Fig. 10.

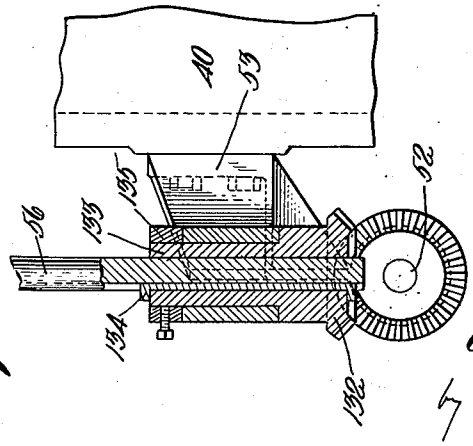


Fig. 9.

Inventor:
August E. Schutte
by Wright Brown Quinby & May
Atty's.

Patented June 24, 1930 1,765,778

UNITED STATES PATENT OFFICE

AUGUST E. SCHUTTE, OF NORTHBORO, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE PATENT AND LICENSING CORPORATION, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS

METHOD OF SATURATING FIBROUS MATERIAL

Application filed September 18, 1925. Serial No. 57,094.

This invention relates to a method of and machinery for saturating or impregnating fibrous material with waterproofing agents, and is more particularly related to the saturation of the "roofing felt," so-called, or equivalent fibrous sheet material usually employed as the base or foundation for prepared roofing, with asphalt, pitches, or like bituminous waterproofing mediums.

Roofing felt is usually saturated with what is termed and known in the trade as a low-melting asphalt, and is ordinarily performed in commercial practice by passing a continuous sheet of felt through a bath of molten asphalt, and permitting the felt to remain submerged and in contact with the molten asphalt for a period of time sufficient to allow the asphalt to pass into the pores and interstices between the fibres of the felt and to be absorbed thereby, after which the felt emerges from the bath and is drawn therefrom between the usual drawing or propelling rolls which also serve to remove or squeeze asphalt from the saturated sheet.

After the saturation of the felt, it is frequently coated on either or both surfaces with "coating" or relatively high melting point asphalt (i. e., blown or oxidized asphalt of a melting point sufficiently high so as not to be rendered semi-fluid or to "flow" when exposed to extreme solar or atmospheric heat in the summer), in which may then be partially embedded, if desired on its exposed or outer face, while the asphalt is still soft or semi-plastic, a surface layer of a material having fireproofing wear-resisting properties, as well as imparting an ornamental and more substantial or solid appearance to the roofing, such as crushed colored slate, granite, or tile, sand, mica, or other equivalent mineral grit.

I have concluded that the usual method and machinery employed for saturating roofing felt does not yield a saturated product having optimum waterproofing and weatherproofing characteristics. One very important cause underlying the imperfect saturation which is effected by the usual method may be traced to the close proximity to the saturating tank of the propelling rolls, which not only remove superficial or surplus asphalt from the surfaces of the saturated felt but through their compressing or squeezing action on the saturated felt as it passes therebetween, squeeze or remove asphalt from the interstitial spaces within the felt, so that after passage therebetween and the resumption or recovery of its initial and normal bulk or thickness, a considerable portion of the asphalt previously contained therein has been extracted.

It is, of course, obvious that the more asphalt the saturated felt contains, the more waterproof, durable and satisfactory it will be for roofing or similar purpose, and that the saturated felt produced as ordinarily possesses such characteristics in proportion to the amount of asphalt contained therein, as well as the completeness or thoroughness and the uniformity of its saturation. For increasing the amount of asphalt in the saturated felt and the efficacy of saturation, it has been proposed to employ pressure or vacuum apparatus for such saturation, but such apparatus is comparatively intricate, troublesome, and expensive, and, so far as I am aware, commercially unsatisfactory.

It is, moreover, highly desirable to employ "coating" or high melting point asphalt, preferably blown asphalt because of its desirable characteristics, for the saturation of the felt, as well as for the coating thereof, since in such instance, if successfully carried out, the saturating and coating operations may be simultaneously effected. A very advantageous feature in a roofing product thus manufactured is its homogeneity or uniformity of character in respect to its asphalt content, since the same asphalt extends throughout the entire cross-section of the sheet and coats the surface or surfaces thereof, instead of comprising, as usual, an asphalt coating of a different character and melting point than the saturating asphalt therewith. But, if coating or high melting point asphalt is substituted for the usual saturating or low-melting point asphalt in saturating felt as ordinarily (that is, by passing it through a bath of molten asphalt), because of the relatively high temperature necessary to fuse or render

such asphalt molten and sufficiently low in viscosity as to cause the rapid permeation of the sheet, as well as the length of contact necessary between the asphalt and the felt in order to effect a satisfactory saturation, the felt becomes markedly scorched and brittle, and its strength and durability and its waterproofing and roofing qualities are thus impaired.

Hence, the object of the present invention, broadly stated, is to provide an efficient method of and machine for the saturation of felt with either the saturating or low melting point asphalt or, preferably, with the coating or high melting point asphalt, but without impairing the desired qualities of the felt and so that the felt will be completely saturated, will contain a maximum amount of asphalt, and thus possess optimum water- and weather-resisting qualities.

In accordance with the present invention, provision is made to materially decrease the time of contact between the felt and molten asphalt, and to increase the efficacy and the rate of saturation over the usual prior practice. Briefly stated, in the practice of the present invention, the saturation of the felt is accomplished by passing the felt through a bath of molten asphalt, and between squeeze rolls which are submerged in the molten asphalt so that upon the resumption or recovery by the felt of its usual or normal thickness after the squeezing action, the felt immediately contacts with the molten asphalt of the bath and is penetrated or permeated thereby, resulting in a thoroughly saturated sheet. Another prominent or salient feature of the present invention resides in passing a plurality of sheets of felt between squeeze rolls which are submerged in molten asphalt. In accordance with such practice, the sheets are conducted separately through the bath and then joined or brought together between the submerged squeeze rolls. In so doing, molten asphalt is entrapped between the confronting surfaces of the sheets and upon passage between the nip of the submerged squeeze rolls, the severe compression exerted on the relatively large amount of compressible material of the sheets passed therebetween, drives or forces the asphalt from the outer surfaces thereinto, and the asphalt entrapped between the surfaces outwardly through the sheets. Thus a complete penetration or passage of the asphalt clear through the sheets is effected by the squeeze rolls. After passage therebetween, the felt tends to recover or resume its original bulk or thickness, and in so doing any voids or interstices produced therein are immediately filled by the contacting molten asphalt so that a completely saturated sheet emerges from the bath. If desired, the sheets may be caused to undergo several squeezings or compressions while submerged in asphalt, to afford a very complete penetration by the molten asphalt, but ordinarily only one or two such compressions are sufficient to obtain the desired results.

The entire saturating action hereinbefore outlined is effected in a period of time sufficiently short so that the felts are substantially unscorched and unimpaired in quality, even where a high melting point or coating asphalt is used under abnormally high temperatures. The preliminary and subsequent immersion in the asphalt, to which the felts are subjected, supplement the rapid forcing or driving action contributed by the submerged squeeze rolls. In other words, instead of effecting a slow saturation of felt by passing it through a bath of molten asphalt and allowing it to remain submerged until it has been sufficiently penetrated or saturated, as in previous practice, this invention provides for a rapid and complete penetration of the felts by forcing or driving the asphalt directly thereinto under compression, and then allowing the fibers and the interstices and voids formed therein after such compression to contact with and take up more molten asphalt, so that the finished, saturated sheets are completely saturated and coated and contain a maximum amount of asphalt as they emerge from the bath.

Moreover, in accordance with the present invention, as the sheets emerge from the bath of molten asphalt with a film of asphalt covering or overlying their surfaces, provision is made for retaining the asphalt contained therewithin. Accordingly, after emergence from the bath, the sheets are initially cooled sufficiently to cause any moisture or gas contained therewithin to be cooled or condensed, but without congelation or hardening of the molten asphalt, thereby causing a partial vacuum therewithin, and force a contraction of the contained asphalt and a further absorption into the sheet of the asphalt of the surface layers.

After such initial cooling, only the excess saturant on the surfaces of the sheet may be removed, if desired, by passage by a pair of scrapers positioned to engage the surfaces of the sheets so as to remove surplus uncongealed asphalt, without, however, compressing or squeezing the felt to cause the extraction or removal of asphalt from the interior thereof.

In certain cases, however, it may be desirable not to remove saturant from the surfaces of the sheets, especially where the asphalt employed for saturation is high melting point or coating asphalt. That is, the coating may be allowed to remain on the surfaces so that the sheets may be surfaced on one or both faces with particles of grit, such as crushed slate or tile, while the asphalt is still soft and plastic. Thus, in such a case, the finished roofing is saturated and coated

by the same operation and the roofing material is characterized by its homogeneity or continuity in respect to its asphalt content.

Where the excess or surface saturant is removed from the surfaces of the sheets by scrapers, the sheets are then subjected to another cooling action, to cause the asphalt therewithin to be congealed or hardened sufficiently to permit passage between propelling rolls which serve to draw them from the saturating tank without squeezing asphalt therefrom, without, however, causing a sufficient congelation to prevent the separation of the sheets.

With these and other features and objects in view, the invention consists in certain novel features of procedure, as well as in the construction, combination, and arrangement of parts of a preferred embodiment of saturating machine, more fully described hereinafter in conjunction with the accompanying drawings, in which

Figure 1 illustrates conventionally and diagrammatically in front elevation a machine for carrying out the saturating process.

Figure 2 shows in front elevation a saturating machine embodying the present invention, with the side of the tank broken away to show the mechanism therein, but with the cooling means omitted for conveniently illustrating the machine in enlarged detail.

Figure 3 represents a plan view of the machine of Figure 2.

Figure 4 represents a vertical, partly broken section through the machine on the line 4—4 of Figure 3.

Figure 5 shows a fragmentary detailed end elevation of a portion of an adjusting mechanism used in connection with the scrapers.

Figure 6 illustrates a section on the line 6—6 of Figure 4 and shows in detail a section through the scrapers and the supporting means therefor.

Figure 7 represents in front elevation a modified construction of saturating machine in which only a single pair of submerged squeeze rolls is employed, with the side of the tank broken away to show the mechanism therein.

Figure 8 represents a section through the scrapers employed with the saturating machine shown in Figure 7, similar to Figure 6.

Figure 9 represents a section on the line 9—9 of Figure 7, and shows in detail certain construction hereinafter described.

Figure 10 represents a section on the line 10—10 of Figure 7, and shows the various instrumentalities which are disposed within the tank.

Referring to the diagrammatic representation of the saturating machine and the process carried out therewith illustrated in Figure 1 of the drawings, a roll of roofing felt or paper 3 is represented as being mounted for unwinding adjacent to each end of a saturating tank 10. Each roll 3 is carried by a core 4 extending axially therethrough, which is supported at either end by a forked upper bearing portion 6, afforded by a triangular frame support. Each roll of felt is preferably steadied or tensioned while being unwound, and in the present instance is accomplished by imposing a frictional resistance on its core. For this purpose, brakes, indicated as a whole at B, are provided to act on both ends of each core. Each brake comprises an arm, or lever 7, which is pivotally mounted at one end on a pivot pin 8 furnished by a bracket 9 which is secured to an end of the saturating tank 10. The arm includes an intermediate shoe portion bearing against the core, and is provided with a plurality of notches 13 near its other end, with any selected one of which may engage a hook 14 on which is suspended weights W. The amount of braking or tensioning of the paper may be adjusted or regulated by moving the hooks from one to another of said notches. Any other suitable arrangement for supporting and tensioning the paper in its unwinding may be employed, if desired.

The felt sheets from each roll are continuously unwound, each being guided over a guide roll 15 mounted above the tank, thence downwardly into the molten asphalt contained in the tank, under a guide roll 16, from which both sheets are brought together into facial contact between a pair of coacting squeeze rolls 17, 17^a, arranged side by side and submerged in the molten asphalt. Thus, in passing into the molten asphalt, each sheet of felt is coated on both surfaces with a film of saturant and in being united and passed between the nip of the rolls 17 and 17^a, the molten asphalt entrapped between the confronting or united surfaces of the sheets is forced outwardly through the sheets, and the asphalt on the outer surfaces of the sheets is driven inwardly therethrough by the squeezing or compressing action exerted by the rolls, so that the sheet is effectively penetrated by the molten asphalt.

After passage between the rollers, the sheets tend to recover their normal bulk and provision is made to allow the fibers and the interstices and voids formed therein after such compression to take up more molten asphalt and to again entrap such asphalt between the facing surfaces prior to a second squeezing operation, which ensures a complete penetration of the sheets. To this end, the sheets are separated from one another as they emerge from the squeeze rolls by a pipe 19 extending transversely therebetween and engaging the abutting surfaces, thus forming a chamber between the sheets, to which molten asphalt is supplied on the surfaces of the sheets through slots or openings in the pipe 19, to which molten asphalt is supplied (under pressure, if desired) from the pipe 20

from any suitable supply source. The outer surfaces of the sheets are, of course, also coated with asphalt, so that upon their convergence and union by passage between a second similar pair of squeeze rolls 18, 18ª positioned above the lower rolls 17, 17ª, asphalt is again forced into the interior of the sheets by the mechanical pressure or squeezing action encountered. The sheets are then drawn from the rolls 18, 18ª into the presence of the molten asphalt of the bath, so that any voids caused in the sheet after compression are refilled by contact with and immersion in the asphalt.

As the sheets emerge from the bath, they are completely saturated and their outer surfaces are covered with films of molten asphalt. In order to confine and maintain a maximum amount of saturant within the sheets, provision is made to cool them sufficiently to cause any moisture or gases contained therein to be condensed or cooled, thus forming a partial vacuum therewithin, and causing the contraction of the asphalt on the surfaces of the sheets and thus to be forced thereinto. While cooling of the sheets may be effected by permitting them to contact with the air of the surrounding atmosphere for a sufficient period of time, in accordance with the present invention the cooling is preferably accomplished by causing a suitable cooling medium to play on the outer surfaces of the sheets. For this purpose, I have shown a pair of nozzles 21, 21ª communicating, respectively, through the conduits 22 and 22ª with a centrifugal blower (not shown). The open ends of the nozzles are arranged in close proximity to the surfaces of the sheets, and air may be delivered or sucked therethrough, causing air currents to play on and cool the sheets, the last procedure being preferable, since in this case any hot air or vapors emanating from the sheets are withdrawn from the room, thus aiding in ventilation.

After the initial cooling, only the excess or superficial asphalt on the surfaces of the sheets may be removed by passage by a pair of scrapers 23, 23ª, positioned to engage the exposed surfaces of the joined sheets. The scrapers merely remove superficial asphalt without, however, squeezing any from the interior of the sheet. After scraping, the sheets are conducted by a second pair of cooling nozzles 24, 24ª communicating, respectively, through the conduits 25 and 25ª with the fan blower (not shown) and arranged to cause air currents to again play on the sheets. The second cooling effects a sufficient congelation or hardening of the asphalt to permit passage between propelling rolls without the squeezing of asphalt therefrom, but without, however, preventing a separation or disunion of the previously and temporarily combined sheets. After such cooling, the sheets are disunited, each passing between a pair of adjacently arranged and superposed propelling rolls 27, 27ª, and may thereupon be further treated, if desired, as by coating and surfacing operations for the manufacture of shingles or other roofing. The schematic or diagrammatic representation thus far outlined explains the process of the present invention and the instrumentalities employed therefor.

I will now refer to Figures 2 to 6, inclusive, which illustrate a form of practical saturating machine embodying the principles hereinbefore set forth in connection with Figure 1, and which may be employed for carrying out the present saturating process. As previously, each felt sheet 29 is unwound from its corresponding roll (not shown) near an end of the saturating tank 33, and is guided downwardly into the molten asphalt over a guide roll 30 supported at either end in a bearing 31 afforded by a bracket 32 depending from an end of the tank. Each felt then passes horizontally toward one another under a guide roll 35 supported at either end in a bearing 37, provided by a bracket 38 extending laterally from the side of a box 40, which serves as a supporting structure and housing for the pressure or squeeze rolls. Both felts are then united and are passed between a pair of squeeze rolls 42, 42ª, which serve to force or drive the asphalt therethrough. The roll 42 is journaled at each end in a bearing 44 furnished by a ribbed bracket 45 on a side of the box 40. To regulate the aperture or amount of clearance between the squeeze rolls so that the degree of squeezing or constriction of the felt may be controlled as desired, the roll 42ª is horizontally adjustable in reference to the roll 42. To this end, the roll 42ª is journaled at each end in a horizontally adjustable bearing 46, which is provided at its upper and lower portions with protrusions or tongues 47, 47, which engage and are movable in guides or ways 48, 48 furnished by the ribbed brackets 49, 49, on the side of the box 40. Each bearing 46 is provided with a laterally extending and internally threaded lug or nut member 51, in which is screwed one end of a threaded shaft or screw member 52 journaled at its other end in a fork 53ª of a bifurcated bracket 53. Rotation of each shaft 52 and consequent horizontal movement of each bearing 46 and the roll 42ª is effected through a bevel gear 54 fixed at one end of the shaft and meshing with a bevel gear 55 fixed at the lower end of a vertical shaft 56 which is journaled at its lower portion in the other fork 53ᵇ afforded by the bracket 53. The upper end of the shaft 56 is journaled in a bearing 57ª provided by a fork of the upstanding bifurcated bracket 57 secured to the box 40, and is provided beyond the bearing 57ª with a bevel gear 58 to which rotation is imparted by a bevel gear 60 meshing therewith and fixed to a transverse shaft 61, which is journaled at either end in a fork 57ᵇ provided by

the bracket 57. Rotation of the shaft may be effected by any suitable means, as by a hand-wheel 64 fixed at an outer end thereto. From the construction described, it is obvious that such rotation effects an adjustment of the roll 42ª toward or away from the roll 42.

After passage through the squeeze rolls 42 and 42ª, the conjoined felts are separated or made to diverge by a pipe or tube 65 inserted transversely therebetween and supplied with molten asphalt from the vertical supply pipe 66 extending through a widened side portion 10ª of the tank and communicating with a suitable supply of asphalt (not shown). The chamber or compartment formed by the separated sheets is supplied with molten asphalt, which is delivered through a plurality of slots or openings 65ª arranged diagonally side by side in the pipe 65, the molten asphalt being applied to and entrapped between the inner surfaces of the sheets. The molten asphalt is preferably supplied to the pipe 65 under pressure sufficient to pass into or penetrate the pores and interstices in the sheet, although this feature is merely an advantageous incidental and is not at all necessary. Since the pipe is maintained stationary in reference to the felts, because of the inclined or diagonal form of the slots, the entire width of the felts will pass under the flow of asphalt. After the application of molten asphalt, the sheets are again made to converge and unite by passage between a second pair of squeeze rolls 67, 67ª, arranged immediately above but without contacting with the peripheries of the first pair, so that any excess molten asphalt not taken up by the sheets is permitted to escape through the aperture or clearance left between the pairs or rolls, as well as between the clearance left between the ends of the rolls and the sides of the box. These clearances are preferably made sufficiently small so that a substantially confined chamber or space is enclosed by the superposed press rolls and the side of the box to allow the pressure afforded by the asphalt supplied under pressure from the pipe 65 to be maintained and to thereby allow a more perfect penetration and saturation of the felt to be effected. The roll 67ª is supported by construction similar to that employed in connection with roll 42, and the roll 67, is adjustably supported in reference thereto by mechanism similar to that associated with the roll 42ª.

After passage between the second pair of squeeze rolls, the felts are again suffused with molten asphalt by passage through the bath, and are passed through a transverse slot 70 in the top of the box, and out of the tank, thence successively through the cooling and scraping means, and are then separated and each felt passed through separate propelling rolls. Provision is made to drive the upper and lower pairs of press rolls simultaneously and independently by common driving means. To this end, fixed to the end of the rolls 42, 42ª are intermeshing gears 107, 107, driven by a gear 108 on one end of a shaft 109, suitably journaled in brackets 110, 110, on the sides of the box 40. To the other end of the shaft 109 is fixed a sprocket 111, driven through a chain 112 by a sprocket 113 fixed to one end of a driving shaft 114. The shaft 114 is journaled in brackets fixed to uprights 76, 76 on either side of the tank 40, and is provided at its other end with a sprocket 115, which is driven through a chain 116 from a motor or countershaft (not shown). The same end of the shaft 109 is also provided with a gear 118 intermeshing with a gear 119 at one end of one of the upper squeeze rolls 42, which, in turn, meshes with a gear on the other squeeze roll 67ª. To permit the lateral adjustment of the press rolls, the shaft 109 must be horizontally adjustable, and to this end the brackets 110, 110, in which it is journaled, are provided with slots 117, 117, through which the fastening bolts 140, secured to the sides of the box 40, extend. Thus, by loosening the bolts, the brackets may be moved horizontally to permit the lateral adjustment of the squeeze rolls, either for the threading of the paper or for the adjustment of the clearances therebetween.

To allow the threading under the guide rolls and between the squeeze rolls when saturation is initially being commenced or for any other desired purpose, provision is made to raise or lower the box 40, and the mechanism associated therewith, out of or into the tank. To this end, the sides of the box 40 are fixed to the ends of arms 71, 71ª, respectively, having internally threaded or nut members 72 and 72ª at their other ends, in which are respectively screwed vertical screw members or threaded shafts 73 and 73ª, which are respectively journaled at their lower ends in step bearings 74 and 74ª, afforded by the brackets 75 and 75ª secured to the side walls of the tank 40. The shafts 73 and 73ª are respectively journaled at their upper ends in transverse bars 76ª and 76ᵇ secured to supporting uprights 76, 76, and are respectively provided with bevel gears 80 and 80ª cooperating respectively with bevel gears 77 and 77ª, respectively affixed to the ends of a pair of shafts 78 and 78ª. The shaft 78ª is journaled at one end in a bracket 79, and at its other end in the fork 81ª of a trifurcated bracket 81, the fork 81ᵇ of which affords a bearing for the stud shaft 78. With the construction described, it will be seen that simultaneous rotation of the vertical shafts 73 and 73ª will cause a vertical movement of the box 40, together with the squeeze and guide rolls associated therewith, into and out of the tanks. To this end, the shafts 78 and 78ª are respectively provided at one end with gears 82, 82ª, both intermeshing with an idler

gear 83 fixed to one end of an idler shaft 84 which is journaled in the third fork 81c of the trifurcated bracket 81. To the other end of the idler shaft 84 is fixed a gear 85 meshing with a gear 86 fixed to a short shaft 87 journaled in a bearing furnished by the upright 76 and to which is affixed a hand-wheel 88, so that in rotating the hand-wheel the box 40 and its associated structure is bodily moved vertically.

To permit the vertical movement of the supply pipes without interrupting the flow of the molten asphalt, the upper end of the pipe 66 is threaded in one end of a swivel joint elbow 104, in the other end of which is swiveled one end of a supply line 105. The other end of the supply line 105 is similarly swiveled to a pipe line (not shown), which communicates with a pump and a source of molten asphalt (not shown). Any other suitable arrangement or construction for permitting the raising and lowering of the pipe 65, together with the squeeze rolls, may be employed, if desired.

To facilitate the threading of the felts between both pairs of rolls and through the slot at the top of the box, the box is preferably provided at one of its sides with a door 150, hinged thereon so that easy and ready access may be had into the interior of the box when it is raised from the tank to permit the insertion and the threading of the felts. After such threading, the box is lowered bodily into the molten asphalt contained in the tank and the saturating operation may be commenced. The asphalt is maintained in fluid or molten condition in the tank by any suitable heating means, as by steam-heating coils 100, arranged in zigzag or sinuous courses at the bottom of the tank, to which steam is supplied through an inlet 100^a, and from which condensate is withdrawn through an outlet 100^b. If desired, in addition to the asphalt supplied thereto through the pipe 65, the tank may be provided with hot molten asphalt from an auxiliary supply line 102 entering thereinto and supplied with molten asphalt from a suitable source (not shown). Any asphalt tending to rise above a certain fixed level in the tank overflows through an outlet or overflow pipe 103 and is conducted back to the asphalt supply to be re-employed in the saturating tank.

After the saturation of the felts in the tank has been effected, they may be initially cooled, as previously described. After such cooling, the excess or superficial asphalt on the surfaces of the felts may be removed by passing them by suitably positioned and angularly adjustable scrapers or doctors, which engage the asphalt on their outer surfaces, to cause the removal thereof, but without squeezing or constricting the sheets to force asphalt from the interior thereof. For this purpose, the conjoined sheets are passed by two scrapers, 120 and 121, each of which is mounted on a shaft 120^a, 121^a, journaled in bearings afforded by a plurality of brackets or hangers 122 fixedly hung on the transverse framework 76^a and in a bearing 123 afforded by the upright 76. The shaft 120^a extends exteriorly of the bearing 122 at one end, and is provided with a collar 124 at its other end, inside the bearing 123, against which a spring 127 presses. Outside of the bearing 123 the shaft 120^a is provided with a handle 125, having a lug 126 on its inner side, which is adapted to engage in the apertures of a radially apertured disc 129 provided with such apertures in arcuate relationship. By pulling the handle 125 and the shaft 120^a to which it is fixed, against the action of the spring, the handle is removed from engagement with an aperture in the disc, and the doctor may be turned to the desired angle for engagement with the surfaces of the felt. The handle may then be released and made to engage the particular aperture corresponding with the angular position of the scraper. After the scraping action, the sheet is then cooled, as previously indicated, so as to considerably congeal the asphalt contained therein prior to passage through the propelling rolls.

In place of an arrangement where two pairs of squeeze rolls are submerged in the molten asphalt, I may employ an arrangement shown in Figures 7 to 10, inclusive, where only a single pair of squeeze rolls 130, 130^a is employed. In such construction, the squeeze rolls are horizontally adjustable in reference to one another, and are vertically movable into and out of the tank by a mechanism substantially similar to that described in connection with the machine already outlined. As a detail of construction, however, one may employ a construction in which the vertical shaft 56 is stationary. As shown in Figure 9, this is accomplished by providing the lower end of the shaft with a bevel gear 132, comprising a hub 133, which is splined by the key 134 into a longitudinal groove formed in the shaft and is journaled for rotation in the fork 53^b of the bracket 53. The gear is prevented from longitudinal movement in reference to the fork 53^b by a collar 135 abutting the upper surface of the fork, and at its lower end by the shoulder afforded by the hub 133. In raising the rolls from the tank, the bracket fixed thereto, together with the bevel gear 133 journaled therein, slide or move vertically in the slot, thus permitting the vertical movement of the box. Thus, instead of supporting the unsubmerged portion of the roll-adjusting mechanism on the box, it may be mounted on the framework 76, 76 secured to the side of the tank. The other construction is substantially similar to that described in connection with the other machine.

While I have confined myself to the description of a procedure and apparatus wherein the felts are threaded and fed upwardly between the submerged squeeze rolls, it is to be understood that the direction of feed of the felts may be reversed: that is, the felts may be fed downwardly into the bath and between the submerged squeeze rolls, then separated and drawn from the bath by propelling rolls located at the side of the tank.

Having thus described this invention, it is evident that various changes might be resorted to in procedure, as well as in form, construction and arrangement of parts, without departing from the spirit or scope of my invention. Hence I do not wish to limit myself strictly to the structure or procedure herein set forth, but

What I claim is:

1. In the manufacture of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of molten asphalt, conjoining and then squeezing said sheets together in said bath to force asphalt entrapped between the facing surfaces outwardly thereinto, and on the outer surfaces of said sheets inwardly thereinto, to effect a thorough penetration or permeation thereof.

2. In the manufacture of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of molten asphalt, conjoining and then squeezing said sheets together in said bath to force asphalt on its outer surfaces, and asphalt entrapped between the confronting surfaces thereinto, separating said sheets, flowing against the confronting surfaces thereof a stream of molten asphalt, and again conjoining and squeezing said sheets together while submerged in said molten asphalt.

3. In the manufacturing of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of molten asphalt, conjoining and squeezing said sheets together in said asphalt, and cooling said sheets to condense or cool gas and vapor contained therein, and thereby causing the asphalt on the surfaces of the sheets to contract and be drawn or absorbed into the pores and interstices thereof.

4. In the manufacture of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of molten asphalt, conjoining and squeezing said sheets together in said asphalt, cooling said sheets but without causing the asphalt contained therein to congeal, and removing excess asphalt from only the outer surfaces of said sheets.

5. In the manufacture of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of molten asphalt, conjoining and squeezing said said sheets together in said asphalt, cooling said sheets in a manner to congeal the asphalt contained therein, but without effecting a congelation sufficient to prevent the separation of the sheets, separating said sheets and propelling or drawing each sheet from said bath, said propelling action taking place subsequent to the cooling and substantially without removing asphalt from said sheets.

6. In the manufacture of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of fluid molten asphalt, conjoining said sheets and subjecting them to a squeezing or compressing action while submerged in said bath to force or drive asphalt thereinto from its surfaces, cooling said sheet, and then separating and separately propelling each sheet substantially without squeezing asphalt therefrom.

7. In the manufacture of roofing, a process which comprises conducting sheets of fibrous material into a bath of molten asphalt, subjecting said sheets to squeezing or compressing action while submerged in said bath, to force asphalt on their surfaces therein, cooling said sheets after they leave the bath to cause asphalt on the surfaces of said sheets to be forced thereinto, scraping excess asphalt from only the outer surfaces of said sheets, cooling said sheets in a manner to congeal the asphalt contained therein but without preventing the separation of the united sheets, and then separating said sheets and separately propelling or drawing each sheet from said bath substantially without removing asphalt therefrom.

8. In the manufacture of roofing, a process which comprises conducting a plurality of sheets of fibrous material into a bath of molten asphalt, pressing said sheets together at successive spaced points in their travel through said bath, forming a pocket between said sheets in their passage from one said point to the next, and supplying fluid, molten asphalt to said pocket.

9. In the manufacture of roofing, a process which comprises applying molten asphalt to a plurality of separate traveling sheets, pressing the sheets together at successive spaced points in their travel, separating the sheets between said points of pressure application, and applying molten asphalt to the confronting faces of separated sheet portions.

10. In the manufacture of roofing, a process which comprises squeezing two traveling sheets together at successive spaced points in their travel, separating the stretches of the sheets between said points to form a compartment extending width wise of the sheet, substantially closing the ends of said compartment, and maintaining said compartment full of molten asphalt under pressure.

In testimony whereof I have affixed my signature.

AUGUST E. SCHUTTE.